



INN-A3-CPUL-R4 Controller PRO

User Manual

2026-05-06 | V1.0.1

Contents

1. Document Description 1	1
1.1 Compliance with standards 1	1
1.2 Version Revision History 1	2
1.3 Warranty Description 2	2
1.4 Safety Precautions 2	3
1.4.1 Safety Instructions 2	3
1.4.2 Security Level 3	4
2. Product Information 7	10
2.1 Naming rules and nameplate description 7	10
2.2 Technical Specifications 8	11
2.2.1 Basic specifications 8	11
2.2.2 Communication specifications 9	12
2.2.3 Power supply specifications 10	13
2.3 Interface Definition and terminal wiring 11	14
2.3.1 Interface Definition 11	14
2.3.2 Terminal Wiring 12	16
2.4 Indicator light description 13	17
2.5 Environmental regulations 15	19
3. Dimensions and installation 16	20
3.1 Module Dimensions 16	20
3.2 Equipment installation 17	21

3.2.1 Installation 17.....	21
3.2.2 Disassembly 20	24
3.3 Electrical Installation 21	25
3.4 Communication connection 22.....	25
4. Programming Example 24	27
5. Operation and maintenance 28	32
5.1 Running and shutdown operations 28.....	32
5.2 Routine inspection and maintenance 28	32
6. Extension module 29	34

1 Document Description

INN-A3-CPUL-R4 controller PRO (hereinafter referred to as controller PRO) is an industrial-grade programmable logic controller independently developed by Zhejiang Visual Intelligent Technology Co., Ltd. Its core features are its high-performance processing capabilities and flexible industrial communication scalability. The hardware supports dual Gigabit network ports (can be configured as EtherCAT or standard Ethernet), and can expand digital, analog and other I/O modules through high-speed backplane. In terms of network, it integrates EtherCAT real-time bus, Ethernet network and multi-protocol communication interfaces to support the construction of a multi-layer network architecture from the equipment layer to the information layer. In terms of equipment maintenance, a Bluetooth module is innovatively added and equipped with a dedicated maintenance APP. The controller PRO also supports 4G and Wi-Fi communications, wireless debugging and operating status cloud monitoring functions.

1.1 Applicable Standards

Table 1 Certification standards1

Certificati on name	Command name		Applicable Standards
CE certificati on	EMC directive	2014/30/EU	EN 61131-2
	LVD instruction	2014/35/EU	EN 61010-1 EN 61010-2-201

	RoHS Directive	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
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1.2 Version Revision History

Table 2 Version Revision History2

Revision date	release version	Change history
2026/01/08	V1.0.0	initial version
2026/05/06	V1.0.1	Updated indicator light descriptions

1.3 Warranty Description

Under normal use, if the product fails or is damaged, Zhejiang Visual Intelligent Technology Co., Ltd. provides warranty services within the warranty period (please refer to the order form for details of the product warranty period). After the warranty period, repair fees will be charged.

During the warranty period, if the product is damaged due to the following conditions, repair fees will be charged.

- 1) Failure to operate this product according to the regulations in this manual may result in damage to the product.
- 2) Product damage caused by fire, flood, voltage abnormality.
- 3) Product damage caused by using this product for abnormal functions.
- 4) Product damage caused by exceeding the specified use range of the product.

- 5) Secondary damage to the product caused by force majeure (natural disasters, earthquakes, lightning strikes).

The relevant service fees are calculated according to the manufacturer's unified standards. If there is a contract, the contract priority will be used. Please refer to the "Product Warranty Card" for detailed warranty instructions.

1.4 Safety Precautions

1.4.1 Safety Instructions

When installing, operating, and maintaining the product, please read and comply with the following safety precautions:

- To ensure personal and equipment safety, please follow all safety precautions marked on the product and described in this manual when installing, operating, and maintaining the product.
- The "Caution", "Warning" and "Danger" items in this manual do not represent all the safety precautions that should be observed, but are only supplementary to all safety precautions.
- This product should be used in an environment that meets the design specifications, otherwise it may cause malfunctions. Functional abnormalities or component damage caused by failure to comply with relevant regulations are not covered by the product quality guarantee.
- Our company will not bear any legal responsibility for personal safety accidents, property losses, etc. caused by illegal operation of products.

1.4.2 Security level

This manual will indicate the user's safety level into three categories: danger, warning, and caution. Please be sure to give this manual to the end user and keep it in a safe place in case you need to read it.

DANGER

Indicates that death or serious bodily injury may result if instructions are not followed.

WARNING

Indicates that death or serious bodily injury may result if instructions are not followed.

CAUTION

Indicates that minor bodily injury or equipment damage may result if operations are not carried out as specified.

1.4.2.1 When designing the control system

When designing a control system, please read and follow the following safety precautions:

DANGER

- Please be sure to design a safety circuit to ensure that the control system can still work safely when the external power

supply fails or the product fails;

- When the rated load current is exceeded or the load is short-circuited, causing overcurrent for a long time, the module may smoke or catch fire. Safety devices such as fuses or circuit breakers should be installed externally.

**WARNING**

- Please be sure to set up emergency braking circuits, protection circuits, interlock circuits for forward and reverse operations, and position upper and lower limit interlock switches to prevent machine damage in the external circuit of the product;
- In order to ensure the safe operation of the equipment, please design external protection circuits and safety mechanisms for output signals related to major accidents; the CPU may shut down all outputs after detecting an abnormality in its own system; when part of the circuit of the product fails, its output may be uncontrolled. To ensure normal operation, it is necessary to design an appropriate external control circuit;
- When the product's output units such as relays and transistors are damaged, the output cannot be controlled to ON or OFF state;
- The product is designed to be used in indoor, overvoltage level II electrical environments. The power supply system level should have lightning protection devices to ensure that lightning

overvoltage is not applied to the power input end, signal input end, control output end and other ports of the product to avoid damage to the equipment.

1.4.2.2 When installing

When installing the device, please read and follow the following safety precautions:

WARNING

- Only professional maintenance personnel who have received relevant training on electrical equipment and have sufficient electrical knowledge can install this product;
- When disassembling or installing a module, all external power supplies used by the system must be disconnected before proceeding. If the power is not completely disconnected, it may cause electric shock or module failure or malfunction;
- Do not use the product in the following places: places with dust, oil fumes, conductive dust, corrosive gases, and flammable gases; places exposed to high temperatures, condensation, wind and rain; places with vibrations and shocks. Electric shock, fire, and misoperation can also cause product damage and deterioration;
- The product is an Open type device. Please install it in a control cabinet with a door lock (control cabinet shell protection > IP20). Only operators who have received relevant training on electrical equipment and have sufficient electrical knowledge

can open the control cabinet.

 CAUTION

- During installation, avoid metal shavings and wire ends from falling into the ventilation holes of the product, which may cause fire, malfunction, or misoperation;
- After installation, make sure there are no foreign objects on the ventilation surface, otherwise it may cause poor heat dissipation, causing fire, malfunction, and misoperation;
- When installing, they should be tightly connected to their respective connectors and the module connection hooks should be locked firmly. If the module is installed improperly, it may cause malfunction, malfunction, and falling off.

1.4.2.3 When wiring

When wiring, please read and follow the following safety precautions:

 DANGER

- Only professional maintenance personnel who have received relevant training on electrical equipment and have sufficient electrical knowledge can perform wiring on this product;
- During wiring work, all external power supplies used by the system must be disconnected before proceeding. If all are not disconnected, it may cause electric shock or equipment failure

or malfunction;

- Cable terminals should be well insulated to ensure that the insulation distance between cables will not be reduced after the cables are installed on the terminal block. Otherwise it may cause electric shock or equipment damage.

 CAUTION

- To avoid electric shock, please cut off the power supply before connecting this product;
- Please refer to the data in the technical specifications for the input power supply specifications of this product. Please provide the power supply strictly in accordance with the data in the technical specifications. If the power supplied is not within the required range, the product will be seriously damaged. Therefore, please regularly check whether the DC power provided by the switching power supply is stable.

1.4.2.4 During operation and maintenance

When operating and maintaining the equipment, please read and comply with the following safety precautions:

 CAUTION

- Only professional maintenance personnel who have received relevant training on electrical equipment and have sufficient

electrical knowledge can operate and maintain the product;

- Do not touch the terminals when the power is on, otherwise it may cause electric shock or malfunction;
- When disassembling modules or connecting or removing communication cables, all external power supplies used by the system must be disconnected first. Failure to disconnect them all may result in electric shock or malfunction.

1.4.2.5 When scrapped

When scrapping your equipment, please read and follow the following safety precautions:

CAUTION

- Please treat it as industrial waste; when discarding batteries, they should be disposed of separately in accordance with the laws and regulations established by each region;
- Scrapped equipment should be processed and recycled according to industrial waste treatment standards to avoid environmental pollution.

2 product information

2.1 Naming rules and nameplate instructions

INN-A 3-CPUL-R4

① ② ③ ④ ⑤

Table 3 Naming rules table3

No.	Description
①	Product range INNOCTRL
②	Module classification level: A-series
③	Product generation: 3, third generation product
④	Module classification: ● CPUL, controller; ● CPL, Coupler; ● MODD, digital module; ● MODA, analog module; ● MODS, serial port module; ● POWER, power module; ● ASSY, attachment.
⑤	● R4: high performance version ● T4: Basic version

2.2 Technical Specifications

2.2.1 Basic specifications

Table 4 Basic specifications table4

Item	Specification
Program capacity	4GB
Data capacity	1.5GB
real time clock	Supported
motion control	Support EtherCAT servo axis
local extension	Up to 32 Class A I/O modules
Programming platform	• ACEphere Studio • CODESYS IDE
programming language	IEC 61131-3 programming language (LD/ST/SFC/FBD/CFC)
Download user program	Ethernet
Firmware burning	Type-C
Firmware upgrade	Ethernet (subsequent support)
Installation method	35mm guide rail installation
weight	350g
Product certification	CE certification
Power terminal block wiring diameter	AWG24~16

2.2.2 Communication specifications

Table 5 Communication specifications table5

Item	Specification
EtherCAT	• Dual Gigabit independent network ports, configurable as EtherCAT interface • The network port only supports one mode at the same time, namely Ethernet or EtherCAT mode.
Ethernet	• Dual Gigabit independent network ports • The network port only supports one mode at the same time, namely Ethernet or EtherCAT mode. • TCP/UDP free protocol
Bluetooth	Support operation and maintenance management, equipment status monitoring, equipment maintenance, and interface configuration
Wi-Fi	• Support 802.11bgn 2.4GHz frequency band • Support AP mode or STA mode • Support wireless debugging • Supports access to the operation and maintenance monitoring system to remotely report status data, production data, etc. • Supports WEP, WPA, WPA2 and other encrypted connections
4G	• Support three network access • Support B1/3/5/8/34/38/39/40/41 frequency band • Support connecting to cloud server • Support virtual networking and remote debugging (subsequent support)
USB 3.0	• 1×USB 3.0 Type-C • Support OTG mode

	• Support firmware upgrade
USB 2.0	• 1×USB 2.0 Type-A • Support HOST mode

2.2.3 Power specifications

Table 6 Power supply specification table6

Item	Specification
Input power rated voltage	24V DC $\pm 10\%$ (21.6V DC~26.4V DC)
Input power supply rated current	• Without module: 1A • Full load: 6A
Bus output power supply rated voltage	5V
Bus output power supply rated current	3A
24V input power protection	Support short circuit protection

2.3 Interface Definition and terminal wiring

2.3.1 Interface Definition

The following is the interface diagram of the controller PRO:

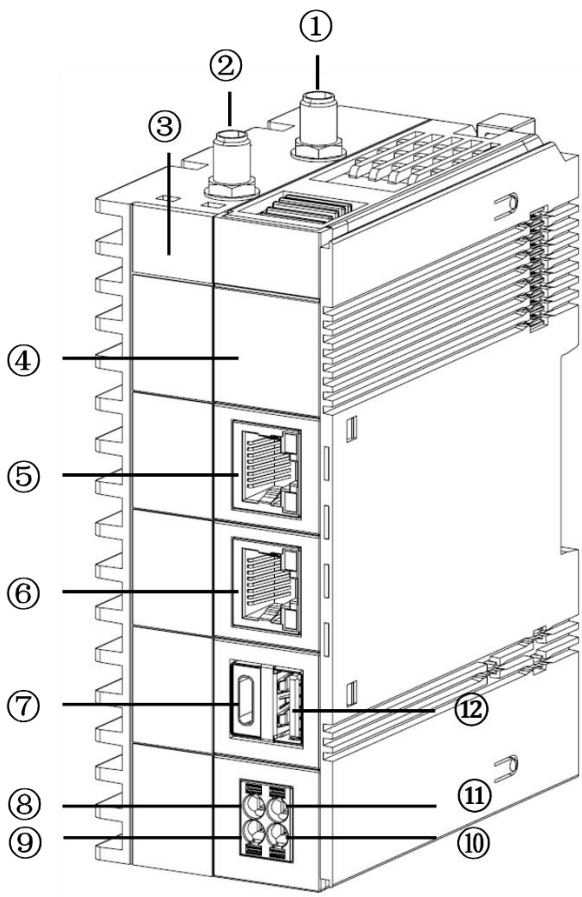


Figure 1 Interface diagram1

The interface slot definition is shown in the following table:

Table 7 Interface Definition table7

No.	Description
①	4G antenna interface, the product comes standard with a 1-meter suction cup antenna

②	Wi-Fi antenna interface, the product comes standard with a 1-meter suction cup antenna
③	Removable panel: for replacing the built-in RTC battery
④	Bluetooth module
⑤	X5: Ethernet communication, RJ45 interface
⑥	X4: Ethernet communication, RJ45 interface
⑦	X2: USB 3.0 Type-C interface, communicates with PC
⑧	On-site power supply 24V DC, positive power supply
⑨	On-site power supply GND, power ground
⑩	System power supply GND, power ground
⑪	The system is powered by 24V DC, positive power supply
⑫	X3: USB 2.0 Type-A interface, communicates with PC

2.3.2 Terminal Wiring

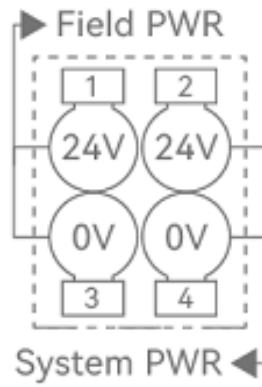


Figure 2 Terminal Wiring diagram2

2.4 Indicator light description

The following is a schematic diagram of the indicator lights of the controller PRO:

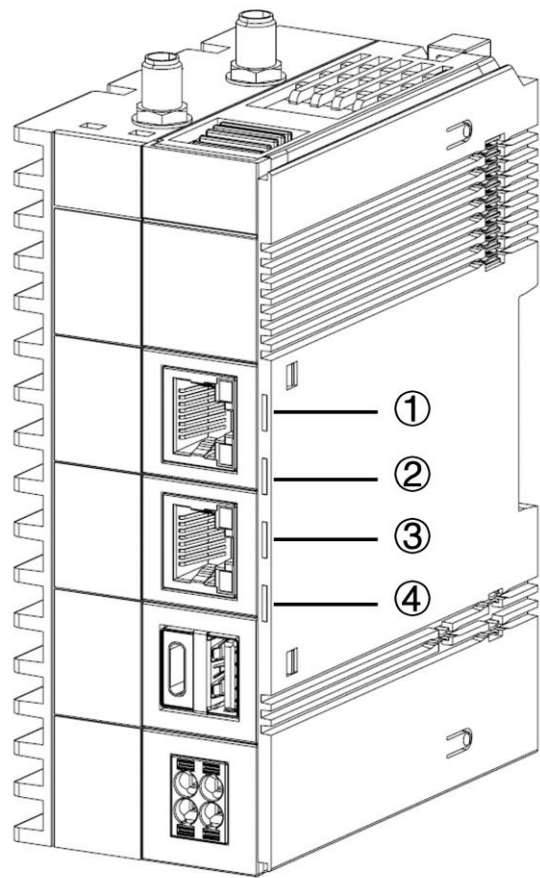


Figure 3 Schematic diagram of indicator lights3

See the table below for the indicator light function description:

Table 8 Indicator light description table8

No.	Type	Color	Description
①	Power indicator light (PWR)	Steady green	Power is on

②	Device Status Indicator (STS)	Steady green	Equipment is normal
		Yellow always on	No equipment or equipment failure
③	Communication status indicator (COM)	Steady green	Sending signal
		Yellow always on	Receiving signal
		Alternate yellow and green	Signal is being received and sent at the same time
④	Function status indicator (SF)	Steady green	APP is connected to the controller PRO via Bluetooth
		flashing blue	The APP has connected to the controller PRO and entered the device details interface

2.5 environmental regulations

Table 9 Environmental requirements table9

Item	Specification
working temperature	-20℃~55℃, horizontal installation
	-20℃~45℃, non-horizontal installation
Storage temperature	-20℃~60℃
ambient humidity	5%~95%RH (no condensation)
Installation altitude	≤2000m
pollution level	II
Protection level	IP20
Mechanical properties	Comply with IEC61131-2, IEC60068-2-6, IEC6008-2-27 standards
Insulation withstand voltage	Comply with IEC61131-2 standard
EMC performance	Comply with IEC61131-2, IEC61000-4-4 standards

3 Dimensions and installation

3.1 Module Dimensions

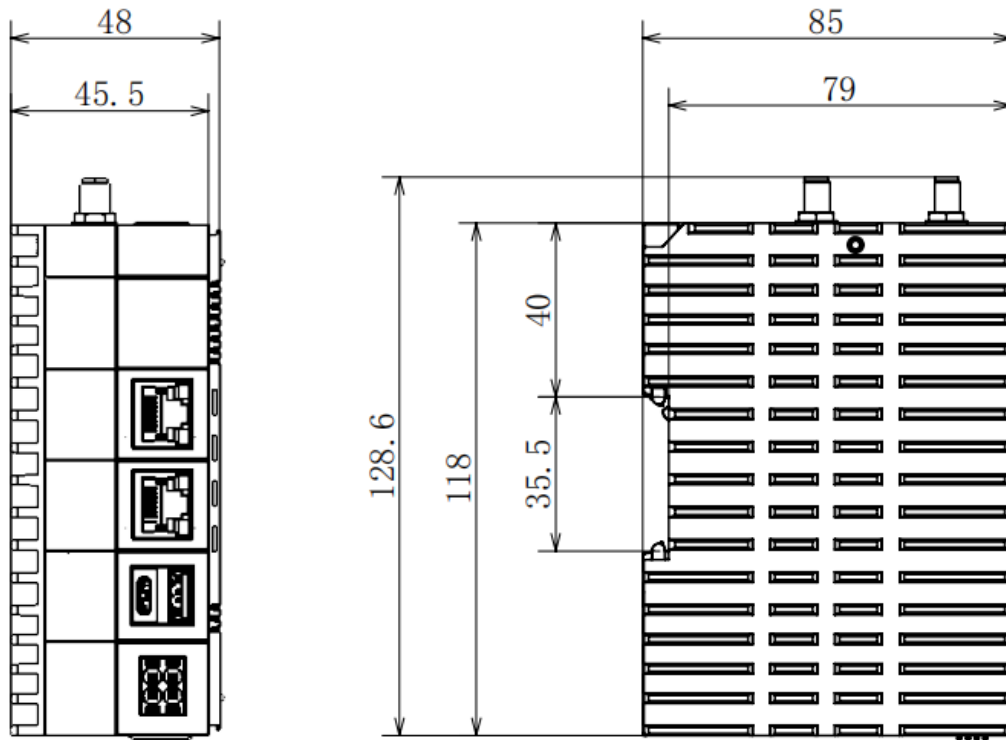


Figure 4 Module Dimensions diagram4

3.2 Equipment installation

3.2.1 Installation

The controller PRO is installed using DIN rails. The DIN rails must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is as shown in the figure below, in millimeters (mm):

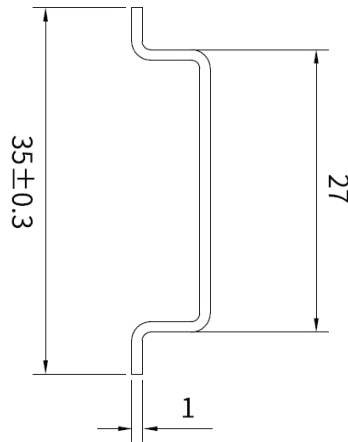


Figure 5 DIN rail diagram5

⚠ CAUTION

If the controller PRO is installed on a DIN rail other than those recommended above, the buckles may not lock properly.

The optimal installation position of the controller PRO is in the horizontal direction. The heat dissipation is designed to be through natural convection. In order to ensure normal ventilation and heat dissipation and sufficient wiring space, a certain gap must be reserved around the controller PRO. The minimum gap that needs to be reserved is as shown in the figure below, in millimeters (mm).

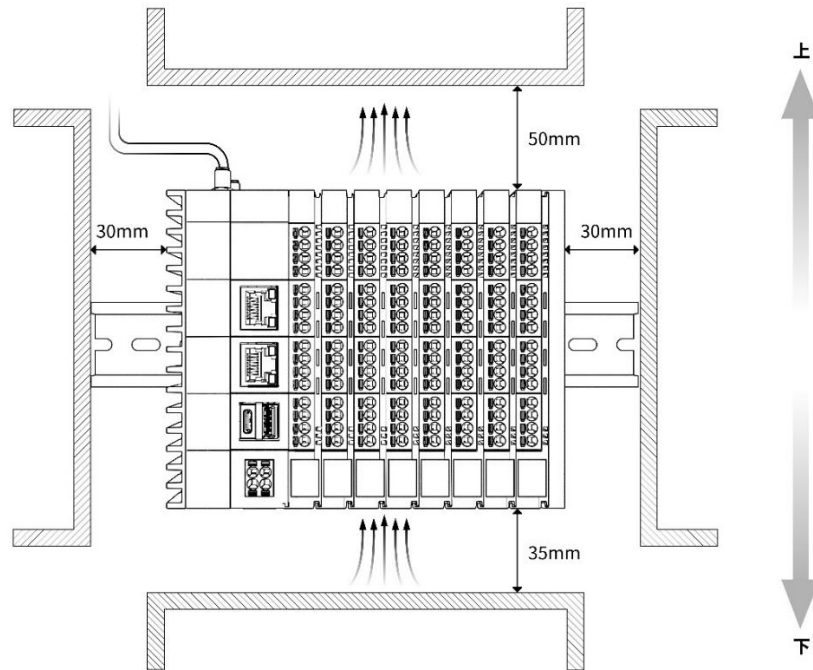


Figure 6 Minimum reserved clearance for installation6

The assembly between the controller PRO and I/O modules is slidingly installed through the top and bottom guide rails, as shown in the figure below.

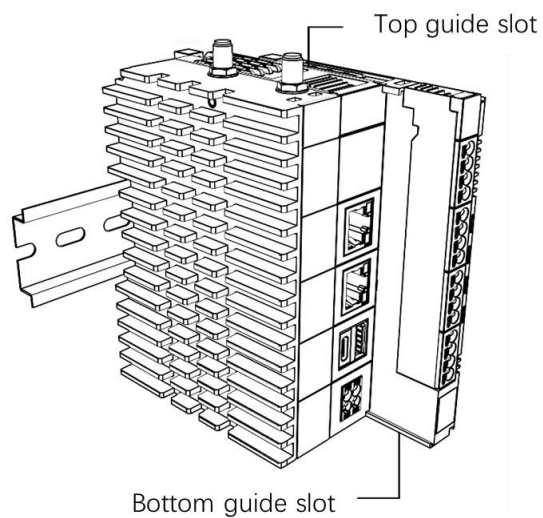


Figure 7 Schematic diagram of controller PRO guide groove7

As shown in the figure below, when installing, align the controller PRO with the DIN rail and press the module in the direction shown by arrow ① so that the module snaps onto the DIN rail. After the installation is in place, press the protruding guide rail part at the top in the direction shown by arrow ②. When you hear a snapping sound, the installation is complete.

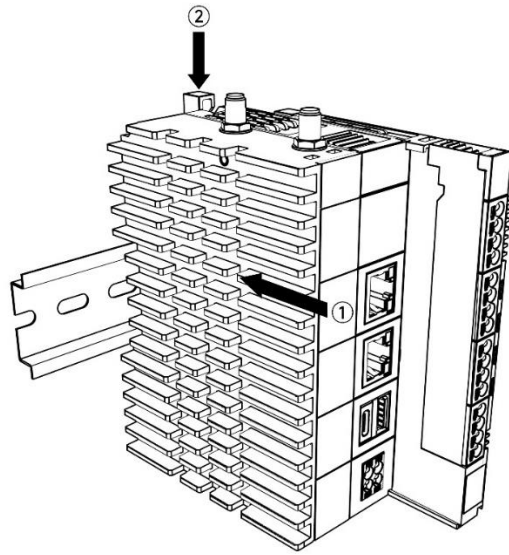


Figure 8 Installation diagram of controller PRO8

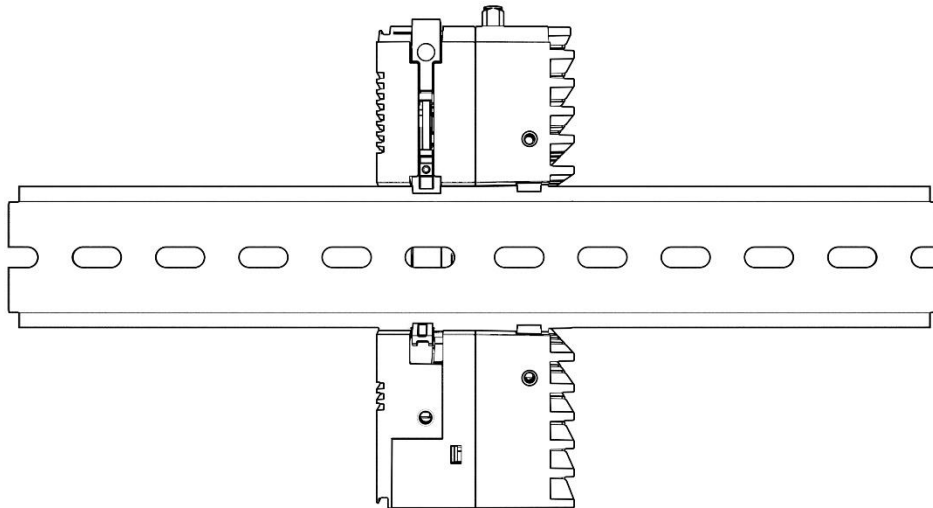


Figure 9 Schematic diagram of DIN rail buckle9

3.2.2 Disassembly

As shown in the figure below, use a flat-blade screwdriver or similar tool to pry up the rail lock, and pull the module straight forward at the buckle position (the raised part). When completed, press down on the top of the lock.

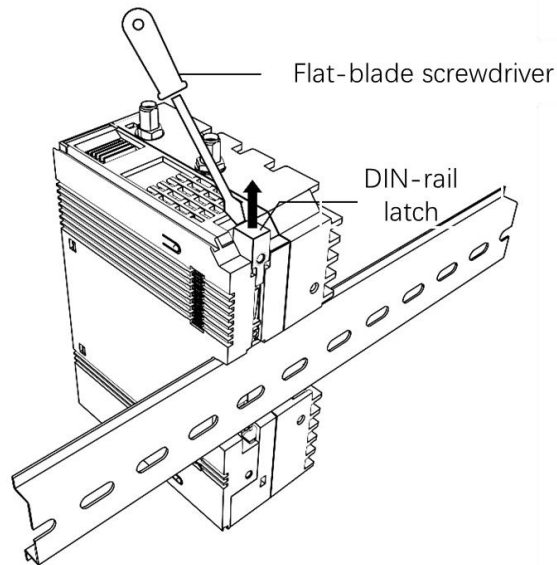


Figure 10 Schematic diagram of prying the guide rail lock

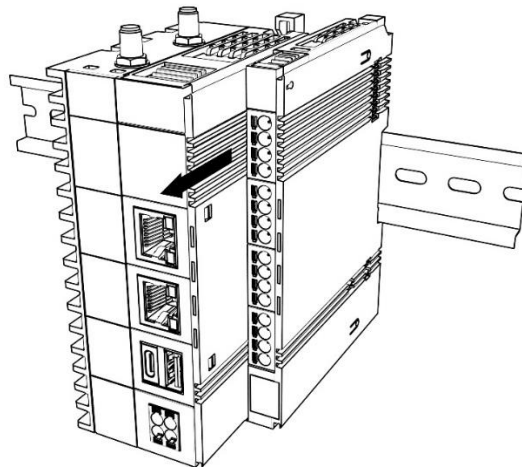


Figure 11 Schematic diagram of pulling out the controller PR011

3.3 Electrical Installation

The following table shows the installation specifications of cables and tube terminals:

Table 10 Cable and tube terminal specifications

Supporting material name	Adaptable wire diameter		Tube type terminal
	mm ²	AWG	Specification
Tubular wire lug	0.25	24	E0208
	0.34	22	E0308
	0.5	20	E0508
	0.75	18	E7508
	1.0	17	E1008
	1.5	16	E1508

3.4 Communication connection

Controller PRO provides a variety of communication connection methods and is suitable for complex industrial automation control systems. Mainly divided into the following categories:

- Remote connection: Supports remote access and debugging via Bluetooth connection to APP, Wi-Fi AP mode or STA mode, and Ethernet network.
- Ethernet connection: Production data reporting, cross-device linkage interaction and remote maintenance can be carried out through the Ethernet interface.

- EtherCAT connection: Supports expansion of device list via wired EtherCAT network.

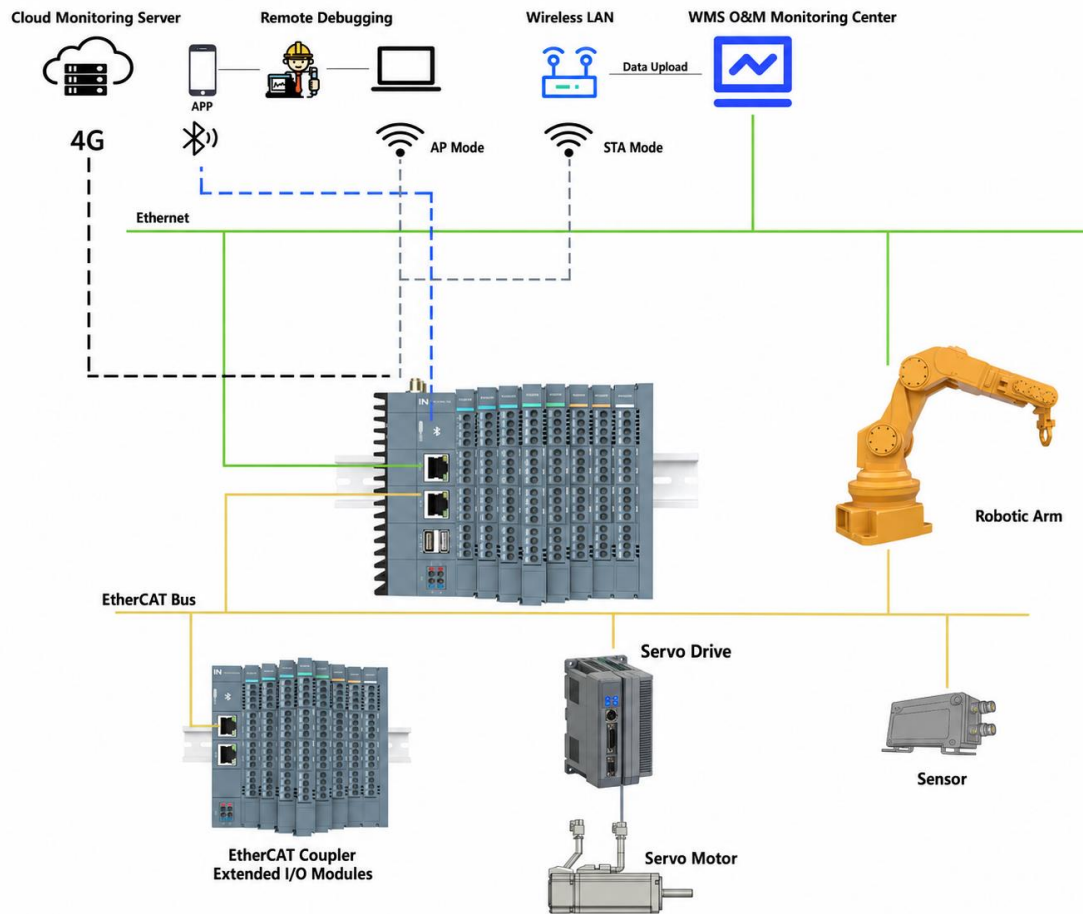


Figure 12 Communication topology architecture diagram12

4 Programming Examples

This section uses CODESYS to demonstrate the module usage process. The steps are as follows:

- 1) In the menu bar of CODESYS, click "Tools" and select "Device Repository".

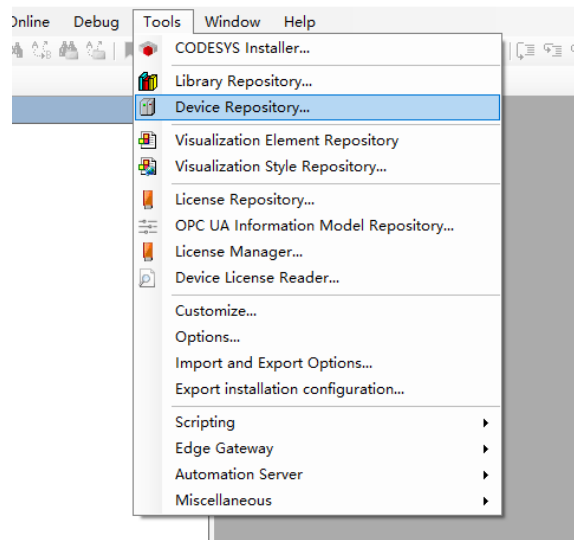


Figure 13 Tools menu drop-down box13

- 2) Store the device's .xml file and .bmp icon file in the same local directory. In the CODESYS "Device Repository" window interface, click "Install", select the provided .xml format file and open all .xml files. After receiving the prompt "The relevant device has been installed in the device repository", click "Close".

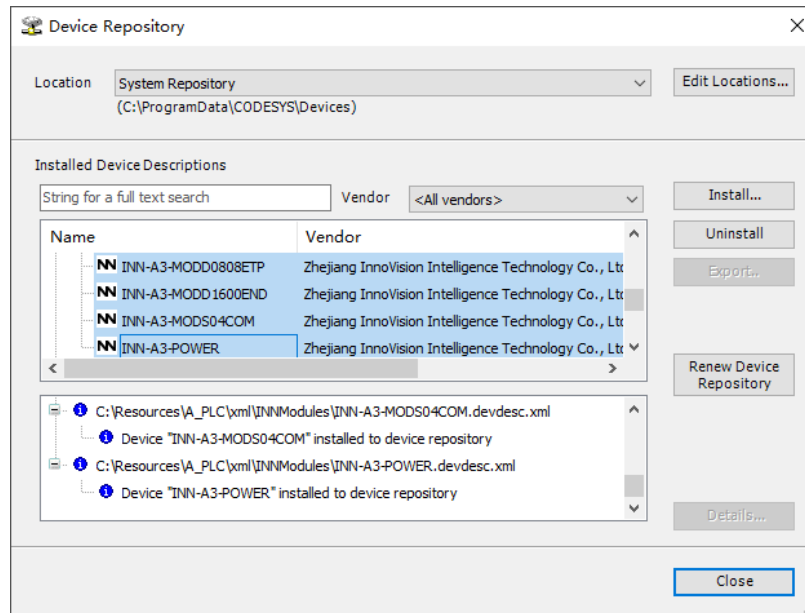


Figure 14 Installing the device into the device repository14

- 3) Right-click "Add Device" in the blank space of the "Device" window on the left side of CODESYS, select the device you just installed, and click "Add Device". After adding it, click "Close" in the lower right corner.

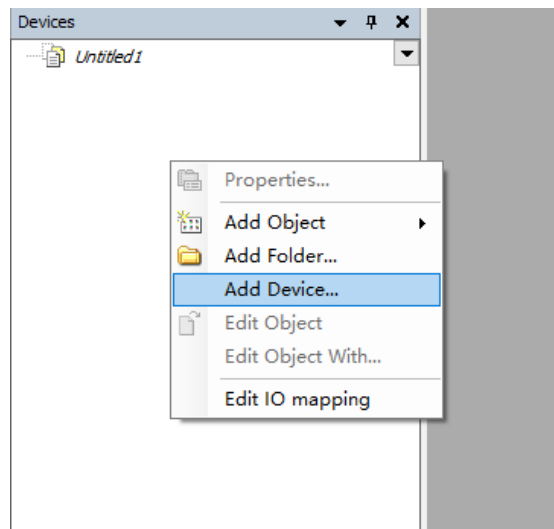


Figure 15 Device window15

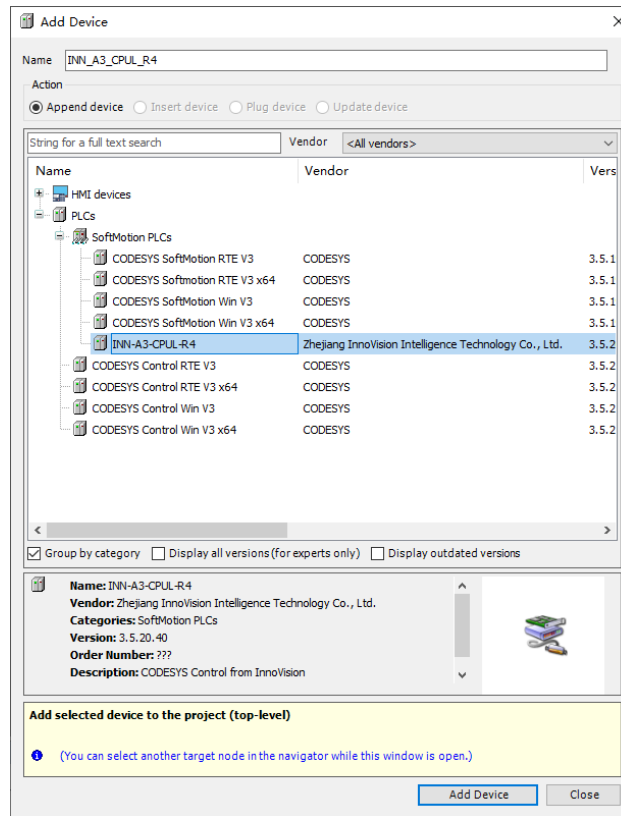
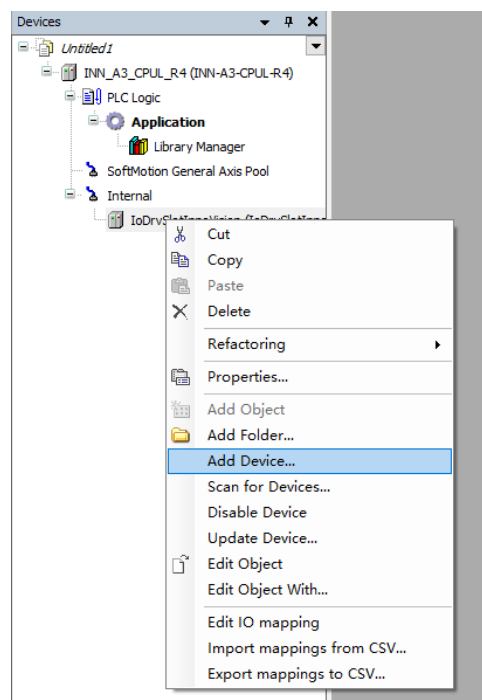


Figure 16 Add device16

- 4) Add corresponding I/O modules based on existing modules.



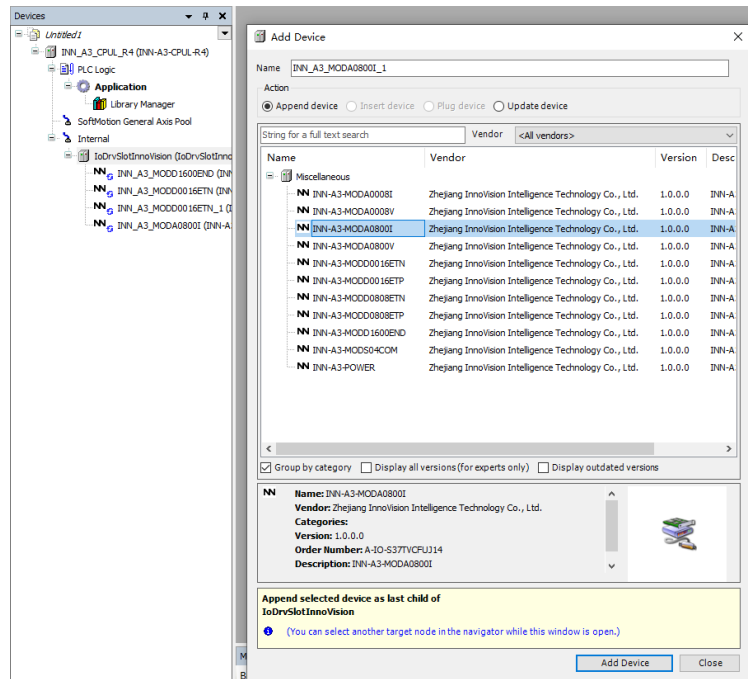


Figure 17 Add I/O module17

5) Write code and create variables.

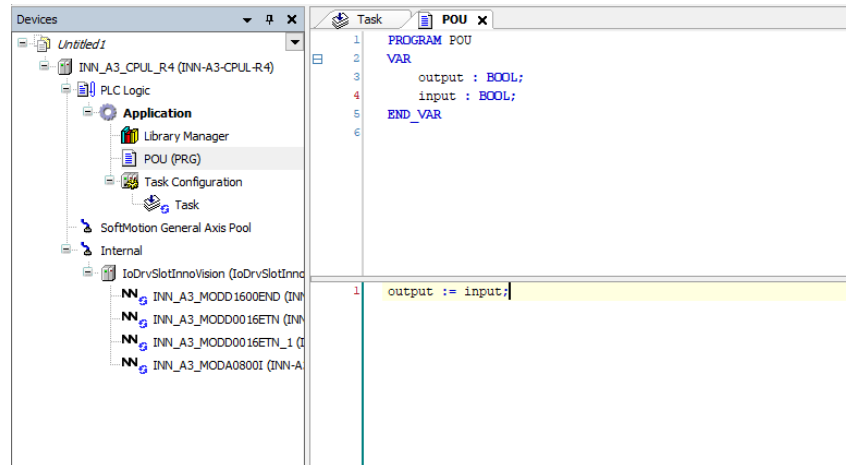


Figure 18 Code window18

6) Take the INN-A3-MODD1600END module as an example to associate variables with I/O modules.



When powered on for the first time or re-powered on, the INN-A3-MODD1600END module defaults to both PNP and NPN modes. The user needs to configure the NPN or PNP input mode through software:

- When mode_pnp_1_npn_2 is set to 1, it is PNP mode.
- When mode_pnp_1_npn_2 is set to 2, it is NPN mode.

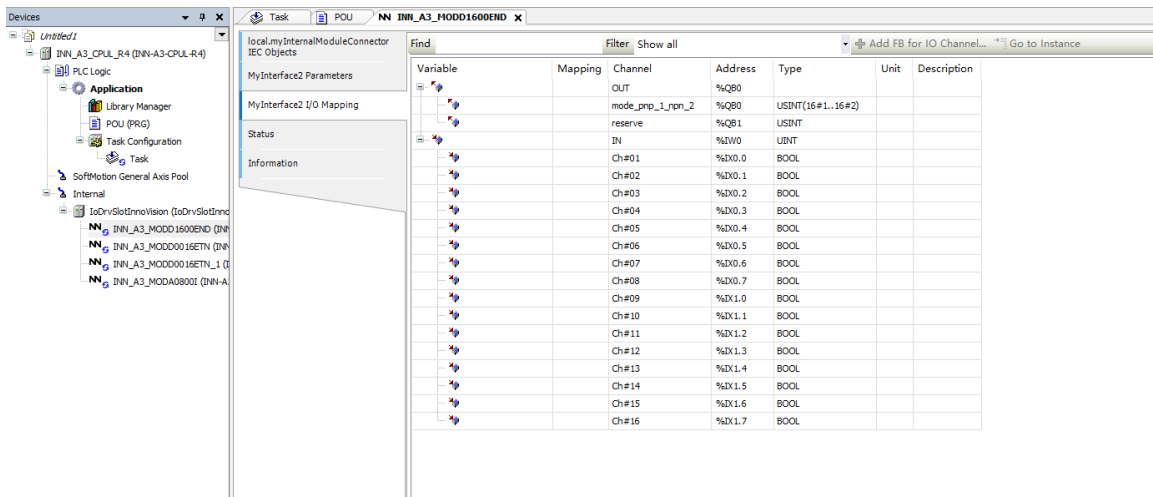


Figure 19 Setting mapping and mode19

5 Operation and maintenance

5.1 Running and shutdown operations

When the controller PRO is in the STOP state, write the program to the controller PRO. After completing the program writing, please follow the steps below to perform run and shutdown operations.

- 1) Start running:
 - a) Set the controller PRO to the RUN state through the PLC development environment;
 - b) Confirm that the device status indicator light on the controller PRO is always on and is green.
- 2) Stop running:
 - a) When you need to stop running, just set the controller PRO to the STOP state through the PLC development environment.

5.2 Routine inspection and maintenance

- 1) Status indicator light check: During daily operation, confirm that the device status indicator light is solid green. If it turns yellow, it means the system is abnormal and needs to be rectified.
- 2) Regular maintenance recommendations:
 - a) Check the ventilation and heat dissipation of the controller PRO every month and remove dust accumulation.
 - b) Back up programs and parameters every quarter to prevent data loss.
 - c) When shutting down for a long time, it is recommended to cut

off the power and provide moisture protection.

6 Extension modules

Controller PRO can be used with the following expansion modules:

Table 11 Expansion module model table11

module	Model	Description
digital quantity	INN-A3-MODD0016ETP	16-channel digital output module (PNP)
	INN-A3-MODD0016ETN	16-channel digital output module (NPN)
	INN-A3-MODD1600END	16-channel digital input module
	INN-A3-MODD0808ETP	8-channel input and 8-channel output module (PNP)
	INN-A3-MODD0808ETN	8-channel input and 8-channel output module (NPN)
Analog quantity	INN-A3-MODA0800V	8-channel analog input module (voltage type)
	INN-A3-MODA0008V	8-channel analog output module (voltage type)
	INN-A3-MODA0800I	8-channel analog input module (current type)
	INN-A3-MODA0008I	8-channel analog output module (current type)
communication	INN-A3-MODS04COM	4-way serial communication module
power supply	INN-A3-POWER	Power coupling module



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